Exhibit F

HWG | HARRIS, WILTSHIRE & GRANNIS LLP

REDACTED - FOR PUBLIC INSPECTION

June 18, 2018

Via Email
Ms. Elizabeth Drogula
Deputy Division Chief
Telecommunications Access Policy Division
Wireline Competition Bureau
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: GCI Rural Health Care Support for Funding Year 2017

Dear Liz:

This letter follows up on our meeting of May 25, 2018. During this meeting, the Telecommunications Access Policy Division ("the Division") requested from GCI Communication Corp. ("GCI") a modification of its TERRA cost study. Specifically, the Division asked GCI to allocate costs specifically to the TERRA middle mile services provided to eligible rural health care providers ("HCPs") under the Rural Health Care ("RHC") Program, distinct from costs to provide TERRA middle mile services to E-rate customers or for GCI's use in serving other customers, including for fixed and mobile voice and broadband services to consumer and commercial customers in TERRA-served communities (together, "commercial services"). In a subsequent conversation, Trent Harkrader also suggested that GCI submit its satellite cost study.

With this letter and its attachments, GCI responds fully to both requests. We are providing alternative approaches to cost allocations to RHC-supported services, as well as our critique of allocating costs to separate particular customer classes that all have the same services available to them. The requested cost allocation to specific customers not only violates the plain meaning of Section 254(h)(1), but also is based on bad economics. Economists have long recognized that use of fully distributed cost methodologies – whether done on a bandwidth or revenue basis – are inherently arbitrary and inappropriate for economically rational rate reviews. Economists have recognized that allocations of common costs are appropriate so long as the result is between incremental and standalone cost. The Brattle report GCI previously submitted with respect to TERRA and the one it submits herewith with respect to satellite show that GCI's cost allocation meets this economic test of reasonableness. No Commission rule dictates a use of arbitrary allocators: GCI's services are not subject to the Part 32 rules.

In reviewing the results of these studies, it is critical to remember that the primary method of determining the appropriate rates for RHC-supported services is competitive bidding. The rules in Section 54.607 are not meant to supplant competitive bidding – or else there would

be no need for the competitive bidding requirement – but to "sanity check" competitive bidding results. As such, it is inappropriate to view these cost studies as if they were cost studies for rate-of-return ILECs to set tariffed rates. The Commission needs to keep in mind that, as it observed in the *BDS Order*, if it allows rates to be too high, markets can self-correct through entry and future bidding, but if it sets rates too low, it will stymie facilities investment deployment in the first place, as well as discourage further investment in upgraded networks.

In any event, these cost studies show that there is no reason further to delay funding commitments for any of these services. With respect to TERRA, even using the ILEC prescribed rate of return – which is too low for highly risky markets that lack the risk-mitigation of NECA pooling – GCI's rates for 2017 will not result in overearnings, irrespective of whether TERRA costs are allocated between RHC, E-rate, and other retail services on the basis of relative bandwidth or relative revenues. This is true even though, in the models provided here and for purposes of illustration, GCI increased the rate it imputed to its own use of TERRA to match the blended average rates charged to [redacted], its largest TERRA purchaser with a volume comparable to GCI's – thereby addressing any concern that GCI was somehow attributing too little revenue to its retail services. These studies confirm the results of GCI's analysis of comparable non-RHC rates, i.e., that GCI's TERRA rates charged for RHC-supported services are reasonable and meet the requirements of Section 54.607 of the Commission's rules. GCI has separately justified the channel termination charges it has passed on to its RHC customers. Accordingly, the Commission should instruct USAC to issue funding commitment letters for all of GCI's TERRA-based FRNs.

With respect to satellite-based services, the submitted cost studies similarly confirm the reasonableness of GCI's competitively-bid rates that were arrived at in a market with four facilities-based satellite service providers capable of operating throughout Alaska. The satellite study shows that for RHC and E-rate together, GCI has consistently earned less than the ILEC prescribed rate-of-return. While the studies show higher levels of return for RHC when allocated to customer groups – with offsetting lower returns for E-rate services – this is the result of arbitrary allocations, not a reflection of economic reality, and the fact that the ILEC prescribed rate of return is too low for these services. As Brattle concludes, the studies show that GCI's returns are in the competitive range, i.e., do not evince evidence of market power. As such, they should be viewed as cost-based, meeting the second sentence of Section 54.607(b) of the Commission's rules, in addition to satisfying Section 54.607(a), as GCI has previously identified. Accordingly, the Commission should also allow USAC to issue funding commitment letters for all of GCI's satellite-based FRNs.

Because these rates are justified based on the costs and revenues for the last full calendar year prior to the start of FY2018, they should also be deemed to be valid for FY2018, at a minimum. Moreover, given the extensive work now completed to document multiple bases for these rural rates, there is no reason for further examination of these rural rates for FY2017 and FY2018 through audits or other investigations.

TERRA Cost Studies

In the attached spreadsheets, notwithstanding our legal and economic objections to this approach, we provide a modified cost study that presents the additional allocations for TERRA-based services, with specific allocations to services provided to rural healthcare providers. We do so in the spirit of working in good faith toward a practical resolution to the outstanding RHC Program 2017 fiscal year funding requests. However, we believe that this approach of deriving an HCP specific rate solely for use in establishing the rural rate under Section 54.607(b) of the Commission's rules, 47 C.F.R. § 54.607(b), is contrary to the plain meaning of 47 U.S.C. § 254(h)(1)(A), as well as Section 54.607(b) when read in light of the statutory requirement. Furthermore, a fully-distributed cost allocation approach – which is what the staff has requested regardless of whether a non-revenue-based or revenue-based allocator is used – is not required by the statute or Commission rules, is contrary to well-accepted economics, and inherently prevents full cost recovery. As such, a fully-distributed cost methodology stymies, rather than enhances, rural broadband deployment. Moreover, the results of a fully-distributed cost allocation based on relative bandwidth yields nonsensical results, with the attributed earnings for RHC services over TERRA decreasing as bandwidth purchased increases (thus increasing the share of expenses allocated to RHC services as a proportion of the total) while at the same time yielding significant underearnings for both E-rate services and commercial services (*See* Attachment 1, TERRA ROR Bandwidth Allocation). This results entirely from the arbitrary allocator. Accordingly, GCI also attaches a second modified TERRA cost study that continues to use a revenue-based allocator but extends allocations to common TERRA costs to services provided to rural healthcare providers (*See* Attachment 2, TERRA ROR Revenue Allocation). For both of these modified cost studies, we have also prepared a step-by-step explanation of the allocation of expenses used to arrive at the expense component of the revenue requirement, as the Bureau requested (*See* "2017 Cost Allocations to TERRA" and "2017 Class Allocations SubTERRA" Tabs in Attachments 1 and 2).

We note that, in addition, we have made two further revisions to the TERRA cost studies. First, during our development of the bandwidth-based allocator, we improved our estimates of bandwidth consumed by the various services, when normalized to be equivalent to priority services. As such, the quantity of bandwidth for commercial uses was reduced from [redacted] Mb to [redacted] Mb for 2017, with lower amounts for prior years. Second, to address staff concerns that GCI may be attributing too little revenue to its commercial uses, we increased the bandwidth capacity price from the 25-year TERRA rate of [redacted] per Mb to [redacted] per Mb per month, which is the effective priority service rate of GCI's largest TERRA customer.[1] We believe that this over-attributes revenue to GCI's commercial uses but provides the Commission with the assurance of using a rate actually charged to a customer other than GCI that purchases at a similar volume level, albeit for a shorter term, to mitigate any concerns that GCI has underattributed revenue to its retail service uses. We have updated the TERRA cost study that GCI first submitted to reflect these changes (*See* Attachment 3, TERRA ROR Submitted Model with [redacted] Revenue Rate).

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[1] The rate is the proportionately blended per-Mbps rate that [redacted] pays for TERRA capacity from the regional hub of [redacted] to its remote village schools and the discounted rate for capacity from [redacted] to Anchorage.

Setting aside the dispute over which TERRA cost study is the most appropriate to use, or whether the initial TERRA cost study should be used, with respect to 2017, the results all converge.[2] Using the prescribed rate of return for ILECs, which, as GCI has previously explained, is too low because TERRA services are not subject to NECA pooling, all studies show that both for services to rural healthcare providers and in aggregate, GCI is not "overearning" for 2017. Accordingly, the Bureau and USAC can accept all TERRA transport rates as justified under the second sentence of Section 54.607(b) of the Commission's rules. Accordingly, FCLs should be issued immediately for all TERRA-based FY2017 funding requests.

Satellite Cost Studies

GCI also provides herein three versions of a satellite cost study. GCI prepared the first satellite cost study consistent with the first TERRA study that GCI submitted (*See* Attachment 4, Satellite ROR Model).[3] This study is supported by a review by the Brattle Group, which concludes that the rates yield earnings in the competitive range, i.e., non-monopolistic, and the rates are above Long Run Marginal Cost, and thus do not create any economic cross-subsidies.[4] Accordingly, this study shows that the satellite rates, which GCI has separately justified through its presentation of comparable rates charged to non-RHCs, are cost justified and reasonable.

GCI's original methodology is the most appropriate cost study approach for both the TERRA and satellite services. This is because customer groups (*e.g.*, E-rate customers versus RHC customers versus retail customers) are not distinct product markets. Moreover, the facilities that make up a significant cost of the services are multiproduct facilities, which means the costs of the facilities should be common among all services over those facilities, not just for the services of a particular customer class. Accordingly, GCI's cost allocation is economically reasonable so long as it falls within the bounds of incremental and standalone costs, as The Brattle Group has explained in its reports.[5]

Nonetheless, in accordance with the Bureau's requests with respect to TERRA, in two of these studies, GCI has allocated its expenses, including return on capital, to RHC-supported services. In the case of satellite services, the transponder capacity is allocated on the basis of bandwidth, treating it as a direct cost of RHC-supported services rather than as a common cost. This is appropriate because satellite capacity is purchased in relatively small increments—per transponder, as we have previously explained. If GCI stopped providing satellite-based RHC-supported services, it could purchase fewer transponders. Thus, RHC-supported services directly

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[2] Note, however, that any Rate of Return under any of these methodologies is overstated, because it allocates all revenues to the TERRA network without any allocation to other facilities that are required to provide services to customers, such as lower 48 transport and the local network.

[3] The Brattle Group reviewed GCI's satellite rate of return study, and provided an opinion, which is available at Attachment 5, The Brattle Group Satellite ROR Report.

[4] *See id.* at 13, 24.

[5] *See id*. and *infra* n. 19.

cause the costs of transponder purchases. This contrasts with TERRA, for which GCI would shed only minimal costs if it stopped providing TERRA-based RHC-supported services.

With respect to common costs allocated to satellite services, one cost study allocates these between RHC and E-rate according to relative bandwidth (*See* Attachment 6, Satellite ROR Bandwidth Allocation) and the other according to relative revenues (Attachment 7, Satellite ROR Revenue Allocation). With respect to each study, GCI provides a step-by-step explanation of the allocation of expenses used to arrive at the expense component of the revenue requirement, similar to what the Bureau requested for the TERRA model. Again, although still arbitrary, we believe that revenue provides the more reliable allocator because of differences in the mix of services purchased for E-rate and RHC. While the RHC and E-rate services combined show a modest amount of earnings above the ILEC prescribed rate-of-return, the total amount for 2017 is de minimis—only about [redacted] Allocating expenses separately to RHC and E-rate supported services shows some overearnings for RHC, which are largely offset by underearnings for E-rate, regardless of allocation methodology. Thus, the 2017 rates should be deemed reasonable in aggregate given (1) that the services were competitively bid in a market with four facilities-based satellite providers, (2) the ILEC rate of return is too low for an entity that cannot participate in pooling, and (3) the arbitrariness of the allocators. Importantly, Section 64.607(b) does not define what constitutes a "cost-based" rate, particularly for a non-dominant interexchange service for which the Commission – when it accepted tariffs for such services – presumptively deemed all such rates as reasonable. There is no evidence in this market with at least four facilities-based actual competitors to support any conclusion that GCI's RHC rates resulted from an exercise in market power. The most reasonable conclusion is that the rate of return, to the extent it reflects anything other than the arbitrariness of the cost allocators, reflects the market's assessment of the appropriate risk-adjusted cost of capital for service to rural Alaska.

Accordingly, the Commission should move forward and instruct USAC to issue funding commitment letters for GCI's RHC customers served by satellite middle mile.

Problems with a Non-Revenue Based Allocator to Separate Costs Between Customer Groups Using a Common Platform

I. SETTING AN RHC-SPECIFIC RURAL RATE VIOLATES SECTION 254(h)(1)(A) OF THE COMMUNICATIONS ACT.

As we discussed in our meeting, the Division asked GCI further to allocate the costs of providing its TERRA middle mile transport service specifically to services supported by the RHC support mechanism, separating those costs from the costs of providing TERRA service to all other GCI customers. As we noted in our meeting, this is an exercise in allocating costs that are nearly entirely common among all TERRA customers: there are minimal TERRA costs that are dedicated exclusively to RHC customers or to other TERRA customers. Accordingly, any allocation of TERRA costs to RHC customers as distinguished from all other TERRA customers is artificial and arbitrary—not compelled by any underlying economic rationale. And GCI's rate schedule for TERRA services does not distinguish between RHC customers and all other critical community facility customers, whether RHCs, schools, libraries, emergency response, or public

safety.[6] The result of the cost allocation exercise that the Division has requested would be to generate an RHC-specific TERRA rate, distinct from the TERRA rates available to all other TERRA customers.

Section 254(h)(1)(A) neither mandates nor permits the creation of such an RHC-specific rate for the purposes of determining the amount of RHC support. Section 254(h)(1)(A) refers to two specific rates. The first is the rate charged to the HCP, which is entitled to "rates that are reasonably comparable to rates charged for similar services in urban areas in that State."[7] This is referenced again in the second sentence of Section 254(h)(1)(A) as the "rates for services provided to health care providers for rural areas in a State."[8] This is the urban rate, to which TERRA costs are not relevant, because services provided in urban areas do not rely on TERRA services. The second rate is the "rate[] for similar services provided to *other customers* in comparable rural areas in that State."[9] This is the rural rate for services provided to non-healthcare customers. These "other customers" are the non-RHC customers. These are the only two rates mentioned in the statute—the urban rate, and the rate for non-RHC customers. There is no RHC-specific rate in the statute, and therefore there is no requirement or basis for creating or justifying an RHC-specific rate that participating providers must charge RHCs.

For the same reasons, there is no requirement or basis in the statute for compensating telecommunications carriers based on an artificial RHC-specific rate. The statute requires that the carrier providing telecommunications be compensated for "an amount equal to the difference, if any, between the rates for services provided to health care providers for rural areas in a State [i.e., the urban rate] and the rates for similar services provided *to other customers* in comparable rural areas in that State [i.e., the non-discounted rural rate]."[10] The focus of this second sentence of Section 254(h)(1)(A) is the amount that "other customers" would be charged. These "other customers" are the non-RHC customers, which could be businesses, schools, libraries, public safety entities, or any other customers in comparable rural areas.[11] The rate paid by "other

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6 Per the conditions of the initial BTOP grant UUI received for TERRA, critical community facilities, but not other customers, can select either the applicable rate from the TERRA rate table or a 25% discount from the month-to-month rate. This is the only way that TERRA rates can differ between commercial customers and those that fall within the definition of "critical community facilities."

7 47 U.S.C. § 254(h)(1)(A).

8 *Id.*

9 *Id.* (emphasis added).

10 *Id*. (emphasis added).

11 The FCC has interpreted "other customers" to be the commercial customers purchasing similar services in the same rural area as the HCP. *See* 47 C.F.R. § 54.607(a). During this rural rate review process, the Division stated that it believes the term also encompasses E-rate customers. GCI has demonstrated that its rural rates are justified based both on the average of its commercial customers rates as well as on the average of its commercial customer rates and the E-rate pre-discounted rates.

customers," by statute, is also the amount the HCP would have been charged had it not been entitled, by the first sentence of Section 254(h)(1)(A), to service at the comparable urban rate.

Allocating costs to RHC service only to produce an RHC-specific rate violates this statutory command to focus on the rates available for similar services provided to non-HCP customers. The only statutorily-permissible way to determine the rural rate "for similar service provided to other customers" is to focus on the costs of all TERRA services, not just whatever portion was allocated to service to HCPs under the RHC program.

The same issues are at play in establishing an RHC-specific rate for satellite transport services. However, for purposes of cooperating with the FCC, GCI has produced a cost study that allocates costs to the satellite middle mile services provided to eligible HCPs under the RHC Program, distinct from costs to provide satellite middle mile services to E-rate customers. While GCI's satellite costs may differ in some ways from TERRA costs in that GCI purchases transponder space from third parties that can be tied more specifically to particular customers, the allocation approach that the Division has requested raises the same concerns with regard to GCI's costs that are shared among GCI's RHC and E-rate satellite customers, which, among other things, include a common sales unit and network support teams.

II. THE PLAIN MEANING OF SECTION 54.607(b) REQUIRES CONSIDERING ALL COSTS AND DEMAND IN SETTING THE RURAL RATE, NOT JUST A PORTION ARTIFICIALLY ALLOCATED TO SERVE RHC-SUPPORTED ENTITIES.

Consistent with the plain language of Section 254(h)(1)(A) of the Communications Act, nothing in the structure or language of Section 54.607 of the Commission's rules supports separating the costs of serving RHC supported entities that are common with all other TERRA-served customers to derive an RHC-specific TERRA rural rate. The same is true for separating the more limited satellite common costs to derive an RHC-specific satellite rural rate. Subsection (a) and the first sentence of subsection (b) set forth mechanisms to determine the rural rate.[12] In (a), the applicable rates are the rates actually charged to commercial customers. In the first sentence of (b), the applicable rates are the tariffed (or other publicly available) rates of other providers available to all customers, not just to RHC customers.

The second sentence of subsection (b), as well as paragraphs (1) and (2) of subsection (b), does not narrow the focus from all customers of a service to just RHC customers. The second sentence of subsection (b) directs a carrier to submit "a cost-based rate for the provision of the service in the most economically efficient, reasonably available manner."[13] The language points to the cost of the "service" without further limitation, not just the cost of the service to the HCP.

This plain meaning is further buttressed by paragraph (2) of subsection (b). In discussing future updates to the cost-based rural rates, this paragraph requires carriers to "take into account

[12] 47 C.F.R. § 54.607(a)-(b).

[13] *Id.* § 54.607(b).

anticipated and actual demand for telecommunications services by all customers who will use the facilities over which services are being provided to eligible health care providers."[14] The focus again is on the costs, and thus the rates, for providing service to *all customers* utilizing the facility, not just the RHC-supported HCPs.

Focusing on the service provided to all customers also is consistent with how a fully-regulated dominant carrier would have tariffed its rates for interstate transport prior to interexchange service detariffing. A dominant carrier would have submitted costs support for the entire tariffed service, as well as the historical or projected demand for that service. Rates would have been determined for the service as a whole, not just the portion allocated to services to one subset of customers—the RHC-supported HCPs.

III. UTILIZING A FULLY DISTRIBUTED COST STUDY IS CONTRARY TO SOUND ESTALBISHED ECONONOMIC THEORY.

Economists have rejected the Division's cost study approach. A non-revenue-based approach, such as bandwidth, is a form of fully distributed cost allocation, in which common costs are not distributed in relation to relative elasticities or any other way that permits actual full recovery, but are allocated on a per unit basis (such as per line, per Mb, or per dollar of revenue). As Drs. Baumol, Koehn, and Willig explained over thirty years ago, subjecting a partially regulated firm operating in a competitive market to a rate of return based on the allocation of the firm's fixed and common costs between various services and products is "futil[e]."[15] This is "because the numbers that emerge from the process are indeed arbitrary, any prices determined by the regulator with their aid can only have a random relation to the prices that would emerge in competitive markets, i.e., the prices required if economic efficiency is not to be undermined."[16]

The inapplicability of a fully allocated (or fully distributed) rate of return model is even more apparent in a competitive environment. As Drs. Baumol, Koehn, and Willig observed, it:

> tends to foreclose any opportunity for the regulated firm to obtain adequate earnings. It is true that regulators who set rates on the basis of fully allocated costs (FAC) attempt to select a set of rates which, if realized in practice, will yield a viable return to the enterprise. But no regulator can force consumers to pay more than they are willing to pay, given the alternatives competition offers to them. As a result, in any regulated market (however defined) customers will end up paying the lower of the two pertinent prices: that dictated by market forces, and that decreed by the regulator on the basis of cost allocation.[17]

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[14] *Id.* § 54.607(b)(2).

[15] William J. Baumol, Michael J. Koehn and Robert D. Willig, *How Arbitrary is "Arbitrary"?—or, Toward the Deserved Demise of Full Cost Allocation,* Public Utilities Fortnightly, Sept. 3, 1987, at 16 (attached hereto as Attachment 8).

[16] *Id.* at 17.

[17] *Id.*

Drs. Baumol, Koehn, and Willig then concluded (as they were later favorably quoted at length by Dr. Alfred Kahn):

> Fully allocated cost figures and the corresponding rate of return numbers simply have zero economic content. They cannot pretend to constitute approximations to *anything*. The "reasonableness" of the basis of allocations selected makes absolutely no difference except to the success of the advocates of the figures in deluding others (and perhaps themselves) about the defensibility of the numbers. There can be no excuse for the continued use of such an essentially random or, rather, fully manipulable calculation process as the basis for vital economic decisions by regulators.[18]

The Commission's findings with respect to business data services generally are also true with respect to any attempt to determine rural healthcare prices for Ethernet services: "Even well-crafted regulations have unintended consequences, inhibiting competition, reducing investment, and end user benefits."[19] As the Commission further noted, "This is especially true in markets as highly dynamic and complex as those for BDS."[20] Given that the Ethernet services provided to HCPs are business data services, the same is true for rural healthcare support under the RHC Telecom Program. If the regulator picks too high a rate, although the universal service fund may for a time pay more than it "should" under a hypothetical (and unattainable) perfect ratemaking, the higher rates will attract competitive entry—or at least competing bids—which will discipline rates over time. If the regulator picks too low a rate, however, entry into the market will be stymied forever. This was the Commission's fundamental, analytical judgment in its *BDS Order*, when it observed, "In general, regulation discourages entry wherever it enforces prices that do not allow firms full cost recovery or raises the costs of entry."[21]

To be clear: utilizing Section 54.607(b) to set the rural rate is ex ante price regulation—and requiring a fully allocated cost study to set the rural rate exacerbates the harm associated with this type of regulation. For instance, in its *BDS Order*, the Commission stated that it would "apply ex ante rate regulation only where competition is expected to materially fail to ensure just and reasonable rates."[22] There is no basis from which to conclude that competition will materially fail simply because a carrier has not sold a particular service to a commercial customer in a given rural area. The Commission should therefore adhere to its policy preference,

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[18] *Id*. at 21. *See also* Comments of BellSouth at Exhibit 1 page 9, Declaration of Alfred E. Kahn and William E. Taylor On Behalf of BellSouth Corporation, Qwest Corporation, SBC Communications, Inc., and Verizon, *AT&T Corp; Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services,* RM No. 10593 (filed Dec. 2, 2002).

[19] *Business Data Services in an Internet Protocol Environment, et al*., Report and Order, 32 FCC Rcd. 3459, 3517 ¶ 126 (2017) ("BDS Order").

[20] *Id.*

[21] *Id.*

[22] *Id.* at 3499 ¶ 86.

articulated in the *BDS Order*, to "prefer reliance on competition rather than regulation, wherever purchasers can realistically turn to a supplier beyond the incumbent."[23]

IV. THE FCC SHOULD ACCEPT EITHER GCI'S RURAL RATE JUSTIFICATIONS OR ITS ORIGINAL COST STUDY METHODOLOGY AND IMMEDIATLEY ISSUE FY2017 FCLS.

The materials that GCI has submitted demonstrate that its rural rates are no higher than permitted by Section 54.607, utilizing each of its subsections as appropriate. GCI has responded to each request for further information and proposal that the Division has presented, and each of GCI's responses have demonstrated that its rural rates adhere to the Commission's rules.

But, even if the Division rejects the rural rate justifications that GCI has submitted under Section 54.607(a) and (b), GCI also has submitted a TERRA cost study that complies with the second sentence of Section 54.607(b), and herein also submits a satellite cost study that complies with the rules. These cost studies independently justify GCI's rural rates. GCI's original cost study evidenced that the rates for services that it provides under the RHC Telecom Program are cost-based; that is, that those rates are reasonable and are not used to cross-subsidize other services that GCI offers or contribute to excessive profits. In addition, The Brattle Group reviewed the study and confirmed that it demonstrated: "1) no TERRA customer is paying prices that are below [long run marginal costs]; and, 2) that the TERRA network is earning a competitive return on capital. Thus, it is reasonable to conclude that no TERRA customer is paying prices that are above the stand-alone cost, and therefore not providing a subsidy to any customer or customer group."[24] Importantly, even when GCI assigns itself a higher rate for its retail revenue purchases equal to the rate that GCI charges its highest volume TERRA customer,[25] The Brattle Group review makes clear that no TERRA customer is paying a price that is below GCI's long run marginal costs.

Finally, if the Commission rejects the GCI-provided justifications and cost studies, GCI has responded to the Division's request for a fully allocated cost model, and even this model demonstrates that GCI's rates are justified. As explained herein, utilizing cost studies that fully allocate costs shared among services provided over the same networks is inconsistent with the Commission's rules, flies in the face of sound economic theory, and contradicts the Commission's own findings with regards to the regulation of these markets. Nevertheless, even these modified models demonstrate that there is no justifiable basis to conclude that GCI's rural rates are unreasonable or inconsistent with the statute.

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[23] *Id.*

[24] Response from GCI Communication Corp. to RHC Telecommunications Program Information Request, Attachment 8, Rate of Return Analysis of GCI's TERRA Network – Brattle Report, at 16-17, n. 31 (Mar. 30, 2018).

[25] *See supra* n.1.

Accordingly, the Bureau should authorize USAC to finalize Funding Commitment Levels for the rural health care providers served by GCI at the requested support levels, as we are now in the final month of the program year.

* * * * *

We remain available to discuss any or all portions of this letter and its attachments with the Division.

Sincerely,

John T. Nakahata
Julie A. Veach
Jennifer P. Bagg
Counsel to GCI Communication Corp.

Enclosures:

Attachment 1 TERRA ROR Bandwidth Allocation CONFIDENTIAL
Attachment 2 TERRA ROR Revenue Allocation CONFIDENTIAL
Attachment 3 TERRA ROR Submitted Model with LKSD Revenue Rate CONFIDENTIAL
Attachment 4 Satellite ROR Model CONFIDENTIAL
Attachment 5 The Brattle Group Satellite ROR Report CONFIDENTIAL
Attachment 6 Satellite ROR Bandwidth Allocation CONFIDENTIAL
Attachment 7 Satellite ROR Revenue Allocation CONFIDENTIAL
Attachment 8 How Arbitrary is ‘Arbitrary’

cc: Trent Harkrader
Ryan Adams
Preston Wise
Arielle Roth

TERRA ROR Bandwidth Allocation Redacted in Entirety

TERRA ROR Revenue Allocation Redacted in Entirety

TERRA ROR Model (with revised Revenue Rate) Redacted in Entirety

Satellite ROR Model Redacted in Entirety

Rate of Return Analysis of GCI's Satellite-Based Services

PREPARED FOR

GCI Communication Corp.

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June 18, 2018

THE Brattle GROUP

This report was prepared for the GCI Communication Corp. All results and any errors are the responsibility of the authors and do not represent the opinion of The Brattle Group or its clients.

Acknowledgement: We acknowledge the valuable contributions of many individuals to this report and to the underlying analysis, including members of The Brattle Group for peer review.

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I. Introduction and Study Objective

GCI Communication Corp. (GCI) asked The Brattle Group to review and opine on a rate of return study of GCI's satellite-based services that was prepared by GCI staff ("Satellite ROR Study"). Specifically, we were asked to assess: 1) whether the methodology underlying GCI's study is consistent with regulatory costing theory and practice and provides reliable indicators of GCI satellite-based service profits; and 2) whether the prices for satellite-based charged to GCI's rural healthcare provider customers are cost-justified (i.e., are not priced in a way that cross-subsidizes the prices charged to other GCI satellite-based service customers).

GCI provides broadband services to rural areas in Alaska through either terrestrial networks (e.g., TERRA) or using satellites. In the latter case, end-use customers are typically connected directly to satellite services, and are not connected to a terrestrial network. To provide these services, GCI procures capacity on satellites that are owned and operated by communications satellite services providers (e.g., Intelsat) by leasing transponders that form the communications channel to and from the satellite. GCI also incurs additional costs in providing satellite-based broadband services, such as the capital and operating costs associated with earth stations (i.e., the ground-based point for transmitting/receiving communications to/from the satellite) and the operating expenses (many of which are jointly incurred with GCI's other services) associated with maintenance, sales, general and administrative functions. The most significant costs to GCI associated with providing satellite-based service come from the leasing of transponders and depreciation.

In developing its Satellite ROR Study, GCI followed the same general methodology that it applied to its TERRA ROR Study.[1] That is, GCI calculated annual net incomes (i.e., revenues less expenses) for 2014-2017, which it then divided by the associated capital (i.e., net plant-in-service plus working capital) to yield a rate of return on the capital invested in the network. For its Satellite ROR Study, however, GCI calculated a rate of return for its rural healthcare provider and schools and library ("RHC/S&L") customers that receive broadband service over satellite, rather than for

[1] Brattle also analyzed and opined on the appropriateness of GCI's TERRA ROR Study. See *Rate of Return Analysis of GCI's TERRA Network.* Prepared For: GCI Communication Corp. Prepared By: William P. Zarakas, Augustus J. Ros and Nicholas E. Powers. March 30, 2018.

its satellite network overall.[2] GCI represented that they were unable, at this time, to conduct their Satellite ROR Study on an overall network basis due to the lack of satellite-attributable revenue data for its commercial satellite customers (i.e., satellite customers other than RHC/S&L). However, GCI provided additional information to us with respect to broadband service over its satellite network, notably concerning pricing to commercial customers in addition to pricing to RHC/S&L customers, which enabled us to opine on whether the prices for satellite-based charged to GCI's rural healthcare provider customers are cost-justified.

As was the case with respect to the preparation of our TERRA report (*Rate of Return Analysis of GCI's TERRA Network,* March 30, 2018), we based our analysis of GCI's satellite (specifically RHC/S&L satellite customers) rate of return and pricing upon data and calculations provided to us by GCI.[3] We relied on GCI to compile its cost and revenue data and apply cost allocation procedures in an appropriate and accurate manner; we did not audit these data and did not examine GCI accounting systems or source reports. However, we did review the application of these data and the rate of return methodology employed by GCI. Accordingly, we are able to opine on the appropriateness of GCI's rate of return calculations. We then provided our own economic analysis to answer GCI's questions concerning whether or not GCI's satellite prices are cost justified.

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[2] Broadly speaking, GCI did this by assigning direct costs to the RHC/S&L customers and allocating indirect satellite costs to the RHC/S&L customers using various methodologies, including in proportion to transponder usage. Common RHC/S&L costs (shared across TERRA and the satellite network) are also allocated in the course of this analysis, in proportion to the satellite network's share of RHC/S&L revenues. Details are provided in Sections III and IV below.

[3] GCI provided cost and revenue data and calculations for 2014 through 2017 on an actual basis. It provided customer-level pricing data that generally covered the period between 2012 and 2016, with that data being most complete for 2015 and 2016.

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II. GCI's Satellite Rate of Return Analyses

Rate of return and cost of service analyses are two primary methods used to assess the appropriateness and cost basis of rates charged for services provided, notably, by utilities and telecommunications carriers.[4] Rate of return analysis measures the ratio of a carrier's realized (or projected) net income to its related net invested capital, and provides an indication of whether a carrier's earnings are excessive by comparing its realized (or projected) rate of return to the level authorized by regulators. Cost of service analysis deals with the distribution of a carrier's costs among the various classes of services and customers. *Embedded* cost of service studies deal with the distribution of a carrier's entire revenue requirement among the various classes of services and customers, while *marginal* or *incremental* cost of service analysis estimates how the total cost of providing a product or service changes as output (for that product or service) changes by a small amount, holding constant the level of output of all remaining services.[5]

We applied the same approach in estimating whether the prices charged to GCI's RHC/S&L customers for satellite broadband services cross-subsidized the prices charged to other (i.e., commercial) customers that we used in our analysis of GCI's TERRA network. There, we cited the widely accepted test of cross-subsidization developed by Baumol and Sidak (1994) that stated "when the firm earns no more and no less than the competitive rate of return, if each of the firm's prices is above its average-incremental cost, then each of those prices *must* be below its stand-alone cost, and vice versa."[6] As was the case in our test of cross-subsidies in GCI's TERRA network, GCI's satellite broadband rates are cost-based if either 1) GCI's satellite broadband prices are above

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4 We describe and discuss the inter-relationship of rate of return and embedded and marginal cost of service analysis in our TERRA report.

5 Marginal cost studies tend to concern themselves with very small changes in output, while incremental cost studies are more general with respect to the size of change in output.

6 Baumol, William J. and Sidak, J. Gregory (1994). *Toward Competition In Local Telephony*. Cambridge, MA and Washington, D.C.: The MIT Press and the American Enterprise Institute for Public Policy Research.

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average-incremental costs and/or 2) GCI's satellite broadband prices are below stand-alone costs – assuming that the rate of return for GCI's satellite network is approximately equal to the rate authorized by the FCC in its Rate of Return Represcription Order.[7]

III. Satellite Costs

GCI's satellite network costs are composed of direct and allocated costs. A description of GCI's satellite network cost areas is provided in Table 1.

Table 1: GCI's Satellite Network Cost Areas

Cost Area	Description	Cost Assignment
Managed Broadband	Management, sales and administrative expenses associated with serving managed broadband customers	Allocated to RHC/S&L satellite customers on revenue basis. Can also be allocated to total satellite customers.
Transponders	Satellite specific costs	Allocated to RHC/S&L customers based on ratio of RHC/S&L coded transponders to total coded transponders
Rural Maintenance Group	Operations, maintenance and engineering in support of rural customers (RHC/S&L and others)	Subject matter expert allocation to RHC/S&L satellite customers
SG&A Allocations	Range of corporate functions	Combination of direct assignment and allocation; allocation to Satellite based on net plant and then allocation to RHC/S&L based on ratio of RHC/S&L coded transponders to total coded

[7] In the Matter of Connect America Fund, ETC Annual Report Certifications, Developing a Unified Intercarrier Compensation Regime, WC Docket No.10-90, WC Docket No. 14-58, WC Docket No. 01-92, Report and Order, Order and Order on Reconsideration, And Further Notice of Proposed Rulemaking, March 23, 2016. In this study, we have assumed these levels to be a permissible level of return. However, these levels of return were established for incumbent local exchange carrier operations, which can have the benefit of NECA pooling to reduce risk, not interexchange middle mile services in highly risky environments such as Alaska. Accordingly, it may be appropriate to use a higher rate of return than those we have used here. Nevertheless, we will refer to these as the authorized rates for the purpose of this report.

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		transponders
Depreciation - Satellite	Satellite specific costs	Allocated to RHC/S&L customers based on ratio of RHC/S&L coded transponders to total coded transponders
Depreciation - Indirect	For GCI net plant that is not assigned to a line of business (e.g., TERRA, satellite)	Allocated to satellite based on ratio of satellite to total GCI net plant, and then allocated to RHC/S&L satellite based on ratio of RHC/S&L coded transponders to total coded transponders

A. DIRECT SATELLITE COMMUNICATIONS COSTS

Satellite communications services require that assets be in place in space (those attached to a satellite) and, also, on earth (earth stations and/or other receiving/transmitting equipment). GCI does not own or operate any satellites (i.e., spacecraft) but leases all or portions of broadband communications capacity on transponders that are carried on the satellite.[8] Specifically, GCI leases transponder capacity on [redacted] satellites that are owned and operated by two communications satellite companies: [redacted].[9]

Transponder-related costs are accounted for as either operating or capital leases, depending on the specific terms and conditions in the leasing arrangement. Under operating leases, GCI is charged a fee for use of transponders on a pre-determined basis (i.e., monthly or annually). These charges are treated as expenses in GCI's income statements. Under capital leases, the leased asset is treated as if it is owned by the lessee and included on its balance sheet. In this case, the depreciation on the asset provided under the capitalized lease is treated as an expense in GCI's income statements.

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8 The satellite spacecraft is frequently referred to as a "bus" while the transponders are examples of satellite "payload."

9 GCI currently leases transponders on: [redacted] It has leased capacity from other satellite communications operators in the past (e.g., [redacted].

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For the earth segment of its satellite network, GCI owns various receiving (from satellite transponders) and transmitting (to satellite transponders) equipment, including earth stations (that connect to a telecommunications network) and equipment that connects an end user directly to the satellite network (e.g., satellite dishes directly affixed to a premise). This equipment is included in GCI's balance sheet and expensed as depreciation.

Table 2 provides a break-down of the capital costs associated with GCI's satellite network.

Table 2: GCI's Satellite Network Plant-In-Service (million $)

	2014			2015			2016			2017		
	Gross Plant	Accumulated Depreciation	Net Plant	Gross Plant	Accumulated Depreciation	Net Plant	Gross Plant	Accumulated Depreciation	Net Plant	Gross Plant	Accumulated Depreciation	Net Plant
Satellite-Related Equipment (On Earth)	[redacted]											
Capital Lease - Horizons 1												
Capital Lease - Galaxy 18												
Total Satellite Plant												

Source: GCI Satellite Rate of Return Analysis.
Note: Minor differences due to rounding.

Satellite services are highly scalable, meaning that broadband capacity (via transponders) can be readily added as demand increases.[10] Thus, it is possible to estimate the costs to serve specific segments of the satellite network. GCI estimated the utilization of its satellite network by its rural healthcare and schools and library customers using transponder utilization data. The results of that analysis are summarized in Table 3.

[10] This is in contrast to terrestrial networks, such as TERRA, which typically go into service with excess capacity in order to accommodate future growth.

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Table 3: Percent of Satellite Network Transponder Costs
(Based on Direct Coding)
For Rural Healthcare and School and Library Customer Segment (million $)

		2014	2015	2016	2017
Rural Healthcare	[A]	[redacted]			
Schools & Libraries	[B]				
Total RHC/S&L	[C]	[redacted]			
Total GCI	[D]				
Percent Allocation					
Rural Healthcare	[E]	[redacted]	[redacted]	[redacted]	[redacted]
Schools & Libraries	[F]				
Total RHC/S&L	[G]	[redacted]	[redacted]	[redacted]	[redacted]

Source: GCI Satellite Rate of Return Analysis.

Notes: Minor differences due to rounding.

[A], [B], [D]: Provided by GCI.

[C] = [A] + [B]

[E] = [A] / [D]

[F] = [B] / [D]

[G] = [E] + [F]

Table 3 shows the annual expenses for satellite transponder operating leases in total and for those transponders that are specifically coded to serve GCI's rural healthcare and schools and library customers. GCI represents that the ratio of RHC/S&L satellite transponder expenses to total satellite transponder expenses (e.g., [redacted] in 2017) is an appropriate indicator of relative costs associated with the entirety of its satellite network. Applying this ratio results in the direct satellite costs that GCI has assigned to its RHC/S&L customers as summarized in Table 4 below.

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Table 4: Direct Satellite Network Costs
Allocated to the Rural Healthcare and Schools & Library Business Segment

		2014	2015	2016	2017
GCI Satellite Network Net Plant	[A]	[redacted]			
RHC/S&L Network Allocator	[B]				
RHC/S&L Satellite Network Net Plant	[C]				
GCI Transponder Operating Lease Expense	[D]	[redacted]			
RHC/S&L Network Allocator	[E]				
RHC/S&L Transponder Operating Lease Expense	[F]				
GCI Satellite Depreciation	[G]	[redacted]			
RHC/S&L Network Allocator	[H]				
RHC/S&L Depreciation	[I]				

Source: GCI Satellite Rate of Return Analysis.

Notes:

[C] = [A] x [B]

[D] excludes the cost of transponder bandwidth that is reserved as backup for the TERRA network.

[F] = [D] x [E]

[G] includes depreciation both on transponder capital leases and satellite-related equipment on Earth.

[I] = [G] x [H]

B. INDIRECT COSTS

GCI also incurs additional costs in connection with its provision of satellite broadband services. Table 5 provides a breakdown of GCI's satellite network costs 1) on a total GCI satellite network basis and 2) for the RHC/S&L segment only.

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Table 5: GCI Satellite Network Expenses (million $), 2017
Total and Allocated to Rural Healthcare and Schools & Library Business Segment

	Total Satellite Network			Satellite Costs Allocated to RHC/S&L Satellite Segment		
	Direct	Allocated	Total	Direct	Allocated	Total
Depreciation	[redacted]					
Transponders Costs						
Managed Broadband Expenses						
Rural Maintenance Costs						
SG&A						
Total						

Source: GCI Satellite Rate of Return Analysis.

Notes: Minor differences due to rounding.

The table shows that total satellite network costs include direct satellite costs (discussed in the section above) as well as costs that are allocated from GCI cost pools.

- Transponder expenses are the only costs that are based entirely on direct assignment.
- A majority of depreciation costs are directly assigned, and a relatively minor portion of total depreciation expenses are allocated from GCI's general plant in service accounts.

All of the remaining cost areas are derived from allocations from cost pools.

- Managed Broadband (MBB) Expenses include the costs of management, sales and administrative personnel and related benefits that directly serve GCI's managed broadband customers, who are primarily rural healthcare, school and library customers.[11] Some but not all of these customers have transport services provided over GCI's satellite network. Transport services for rural healthcare, school and library customers not served over the satellite network are served over GCI's TERRA network or over one of GCI's non-TERRA terrestrial networks. GCI allocated MBB expenses to its satellite network (as a share of total MBB expenses) using a revenue allocation basis.

[11] For example, rural healthcare and schools and libraries together accounted for [redacted] of managed broadband revenue in 2017.

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- Rural Maintenance Costs include operations, maintenance and engineering costs incurred in support of rural networks (i.e., TERRA, satellite, and GCI's other terrestrial networks). GCI allocated these costs to its satellite network based on input from the involved subject matter experts and department heads, who provided percentage estimates of time spent on satellite related operations, maintenance and engineering. Then, the portion that was assigned to the satellite network was allocated to RHC/S&L based on the RHC/S&L Network Allocator, as shown in Table 3 (in 2017).
- Sales, General and Administrative (SG&A) covers the full range of GCI's corporate functions, including: IT; corporate communications; product management; cost and capital management; accounting; legal and regulatory; human resources; and, other general and administrative functions. SG&A is a comparatively large cost area, totaling about for GCI overall in 2017. A sizable portion of this amount was directly assigned to various GCI business segments, while are common costs that are then allocated. GCI's satellite network customers were allocated roughly of this amount, based on the ratio of the satellite network's net plant to the total GCI net plant.[12] The portion that was allocated to the satellite network customers was then assigned to RHC/S&L customers according to the RHC/S&L Network Allocator, which as described above reflects those customers' share of GCI transponder utilization.

C. RHC/S&L Segment Satellite Costs

The total costs for satellite services provided to GCI's RHC and S&L customers (other than the costs associated with taxes and rate of return), including direct satellite network costs and allocated cost pools, are summarized in Table 6.

[12] The "net plant" allocation basis is also referred to as the purchased plant, property and equipment, or "PPE" allocator.

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Table 6: Satellite Network Costs (million $), 2014-2017
Allocated to the Rural Healthcare and Schools & Library Business Segment

Cost Category	2014	2015	2016	2017
Depreciation	[redacted]			
Transponders Costs				
Managed Broadband Expenses				
Rural Maintenance Costs				
SG&A				
Total				

Source: GCI Satellite Rate of Return Analysis.

The table indicates that satellite costs associated with serving GCI's rural healthcare providers and schools and library customers have increased by [redacted] since 2014. GCI explained that this increase can be traced to growth in demand for satellite services by these two customer classes.

IV. Revenue and Rate of Return Analysis

GCI provided the revenues from its RHC and S&L customers receiving broadband over satellite for the years 2014 through 2017. GCI represented that the vast majority of these customers are directly connected to the satellite network (i.e., have satellite receiving/transmitting equipment at their premise) and do not incur local loop or other charges from GCI, and estimates that at least [redacted] of revenues from these customers reflect satellite broadband costs.[13]

[13] It would thus be more precise for GCI to reduce the revenues that it included in its satellite network rate of return analysis by a small amount. However, including all satellite revenues in its ROR Study reflects a conservative approach in estimating its rate of return because, mathematically, higher revenues yield a higher ROR, all other factors held constant.

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GCI was not able to provide revenues for the non-RHC/S&L customers (i.e., commercial customers) that it serves using the satellite network. GCI indicated that the satellite network is only one input involved in serving these customers, and that dividing the revenues from those customers between the satellite network and other assets would have been extremely burdensome and ultimately arbitrary given the lack of economic theory to guide such a calculation.[14] Accordingly, GCI indicated that they also excluded direct and indirect costs associated with non-RHC/S&L customers.[15]

The revenues for GCI's RHC and S&L customers that receive broadband service over GCI's satellite network are shown in Table 7.

Table 7: RHC/S&L Customer Satellite Revenues (million $)
2014-2017

	2014	2015	2016	2017
Rural Healthcare Schools & Libraries	[redacted]			
Total	[redacted]			

Source: GCI Satellite Rate of Return Analysis.

The growth in revenues is driven by increased demand for satellite services by RHC/S&L customers. Revenues grew by [redacted] between 2014 and 2017, from [redacted] slightly higher than but in line with the [redacted] increase in satellite network costs referenced in the previous section.

[14] GCI made similar representations in explaining why it was unable to provide a break out of revenue associated with the various input segments (e.g., middle mile and local loop) for its non RHC/S&L customers served over its TERRA network.

[15] GCI identified direct costs associate with the non-RHC/S&L customers using the model of transponder coding and usage discussed above and whose results are summarized in Table 3. Indirect costs associated with non-RHC/S&L customers include allocations of SG&A, rural maintenance costs, and depreciation associated with GCI's general plant in service accounts.

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GCI used the cost and revenue data summarized above in combination with tax considerations in order to calculate annual rates of return for the RHC/S&L portion of the satellite network. The calculations of these returns are provided in Table 8.

Table 8: Annual Satellite (RHC/S&L) Rate of Return Analysis ($M)

		2014	2015	2016	2017
Revenue	[A]				
Expenses	[B]				
Net Income Before Taxes and Interest	[C]				
Tax Rate	[D]				
Taxes	[E]				
Interest	[F]				
Net Income After Taxes and Interest	[G]				
Net Capital	[H]				
Working Capital	[I]				
Total Capital	[J]				
Allowable Rate of Return	[K]				
Allowable Net Income	[L]				
Over-Earned Amount	[M]				
Actual Rate of Return	[N]				

Source: GCI Satellite Rate of Return Analysis.
Notes: All numbers are in millions of dollars unless otherwise stated.
[A], [B], [D], [F], [H], [I], & [K]: Provided by GCI.
[C] = [A] - [B]
[E] = [C] x [D]
[G] = [C] - [E] - [F]
[J] = [H] + [I]
[L] = [J] x [K]
[M] = [G] - [L]
[N] = [G] / [J]

The table indicates that the actual rate of return ranged from a low of [redacted] in 2015 to a high of [redacted] in 2017 and over the period averaged [redacted]. In three of four years, these returns are below the rate authorized by the FCC in its Rate of Return Represcription Order as is the average value

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over the time period. This indicates that GCI's profits on the RHC/S&L portion of its satellite network are generally below monopoly levels.

The upper portion of Table 8 calculates net income after taxes and interest. For 2017, revenues realized from satellite services to RHC/S&L customers totaled [redacted]. Subtracting total expenses [redacted] leaves [redacted] in net income before interest and taxes. At [redacted] of net income, taxes in 2017 were [redacted] yielding a net income after taxes and interest equal to [redacted]

The second panel of Table 8 presents the calculation of the rate of return on the RHC/S&L portion of the satellite network. As indicated in the table, GCI earned a rate of return of [redacted] in 2017, slightly above the return authorized by the FCC of an average of 10.875% for the whole of 2017.[16]

The table also indicates that total capital in the RHC/S&L share of the satellite network (as represented by GCI and including allocated net capital and working capital) equaled [redacted] million in 2017. Applying the FCC's allowable 2017 average rate of return (10.875%) to this amount would produce allowable net income equal to [redacted]. In other words, in 2017, the RHC/S&L portion of the satellite network's actual net income was [redacted] more than its allowable net income. The table also indicates that in the three previous years, GCI earned less than the allowable amount on the RHC/S&L portion of the satellite network. Overall, over the 2014-2017 period, GCI's rate of return earned on the RHC/S&L portion of the satellite network was within competitive bounds.

V. Cost-Based Rate Analysis

Monopoly profits can arise only if prices in the aggregate are set significantly above the competitive level, which in competitive markets is the marginal cost of production. As indicated above, the rate of return for the RHC/S&L portion of GCI's satellite network has, in recent history, generally

[16] The authorized rates were 11.25% in 2014 and 2015, averaged 11.125% in 2016, and averaged 10.875% in 2017. See Rate of Return Represcription Order, *op. cit.*

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been below the FCC's authorized rate of return, which is a proxy for the competitive market level (i.e., not reflective of monopoly profits). It is reasonable to also expect that the rate of return for GCI's satellite network as a whole will conform to this level.

- The incremental costs of providing satellite service are quite scalable; fulfilling increased demand is met with additional leasing of transponders, which GCI has represented have a unit price that is roughly constant.

- Incremental revenues from GCI's non-RHC/S&L (i.e., commercial) customers are roughly equal to the per unit revenues for RHC/S&L customers. As will be discussed further in the section below, commercial customers receiving "dedicated" broadband services are charged a slightly higher rate than are RHC/S&L customers, but commercial customers receiving broadband at a lower service quality level are charged less.

This suggests that the overall rate of return for GCI's satellite network is roughly the same as the return for the RHC/S&L segment of the satellite network.[17] With this in mind, we can turn to the question of whether the prices charged by GCI for services provided over its satellite network are cost-justified. That is, is there a way to assure that none of GCI's customer classes (notably, GCI's rural HCP customers) are paying "too much," thereby subsidizing another customer class that is paying "too little"?

In the absence of specific marginal cost studies, we rely on rougher estimates of incremental costs and standalone costs as indicators of (the absence of) cross-subsidization. Recall that, assuming an overall competitive rate of return, it is understood that there is no evidence of cross-subsidy if each

[17] GCI also provides other telecommunications services, which are subject to competition sufficient to prevent it from earning long-run monopoly profits. For wireline voice products and services, GCI is a non-dominant provider and a state-certified competitive local exchange carrier.

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of a firm's prices is above its average-incremental cost,[18] or, equivalently, if each of that firm's prices is below its stand-alone cost.

GSI has indicated that it provides two general classes of broadband satellite service, each of which has different pricing levels:

- "Dedicated" broadband, in which the customer is essentially guaranteed a service level (e.g., 100 Mbps).

- "Shared" broadband, in which a customer receives a reasonable but not guaranteed level of service. Shared services, such as dedicated internet access service (DIAS), is less expensive (to the customer) than is dedicated broadband service because it is "oversubscribed," meaning that, in the aggregate, more capacity is sold to customers than is available at any given point in time. This means that there is a risk, at high-traffic times, that the aggregate demand for broadband services may exceed capacity, resulting in occasional service quality issues.[19]

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[18] In competitive markets (i.e., where no firm has monopoly power and there are no other market failures), market forces ensure that prices are efficiently set so that no customer is paying prices that are either too high or low. That is, the forces of competition result in prices being set so as to equal the marginal cost of production. Any price lower than the marginal cost of production means that the cost to produce the product is higher than the marginal value consumers receive from the service and implies that the service cannot and should not be produced in the long run as the firm cannot profitably produce it without the firm receiving some type of subsidy. Furthermore, the product should not be produced because customers do not place a high-enough value on it, vis-à-vis the costs of production.

[19] For example, a company could have 100 Mbps of capacity set aside for shared broadband services, which they use to provide 10 Mbps of shared broadband service to each of 20 customers. If all 20 customers are trying to use their full allotment of capacity at the same time, the available capacity will be insufficient. The potential for these service issues explains why some residential broadband, for example, is described in marketing materials as providing services "up to 10 Mbps." The risk of excess demand creating service quality issues will generally increase with the degree of over-subscription.

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GCI's rural healthcare provider customers typically purchase dedicated service, as some of their broadband needs are for critical uses. Schools and libraries and most commercial customers tend to purchase shared services (DIAS or otherwise), although some S&L and commercial customers opt to purchase dedicated broadband (over satellite) services.[20] Commercial customers also tend to purchase shared services, though again GCI has provided data on two commercial customers who have purchased dedicated broadband capacity over satellite in recent years.

Table 9 provides a comparison of the average prices paid for dedicated broadband services over satellite by each class of customers for each of the past several years.

Table 9: Average Prices (per Mbps) for Dedicated Satellite Broadband Services By Customer Class, 2015-2016

Customer Class	2015	2016
Commercial	[redacted]	
Schools & Libraries		
Rural Healthcare		

Source: Brattle calculations based on data provided by GCI.
Notes: Averages reflect a weighted price, where the weights correspond to the bandwidth (in Mbps) purchased by each customer or account. Calculations are based on contracts in effect as of December 31st of each year.

The table shows that the rates charged to commercial customers for dedicated broadband are generally above those for RHC and S&L customers. For example, in 2016, the average rate charged to commercial customers exceeded that for rural healthcare customers by [redacted]. There are few schools and libraries that subscribe to dedicated satellite broadband services, and, in these cases, the prices charged by GCI are significantly below the prices charged to GCI's commercial customers.

[20] Overall, a relatively small percentage of S&L and commercial customers who receive broadband service over satellite subscribe to dedicated broadband services.

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Table 10 provides a sample of prices that are charged to commercial customers for shared broadband services.[21]

Table 10: Illustrative Commercial Prices for Shared Broadband Services

Customer	Service Description	Monthly Price	Mbps	Price per Mbps
[redacted]				
Sample Average (weighted by Mbps)				[redacted]

Source: Provided by GCI.

As indicated, the prices paid by this sample of commercial customers for shared broadband services is significantly below the average price paid by commercial customers for dedicated broadband services, and ranges from [redacted] per Mbps-month to [redacted] per Mbps-month. The range among prices reflects several factors, including but not limited to geographic differences, differences in the term length of the contract, quantity discounts, and differences in the degree of competition that GCI faced when negotiating the price with a given customer.

We approximated the long run marginal cost (LRMC) for GCI's satellite network by calculating its unit "capacity cost." The capacity cost concept spreads an investment's capital costs (which are frequently incurred at an initial point in time) across the capacity of plant, and relies on the divisibility of time to make the costs of lumpy investments appear divisible. Capacity costs are typically measured as the annualized capital-related costs in a network (or portion thereof) plus

[21] As indicated earlier, GCI indicated that it bills customers for a mix of telecommunications services which may include satellite transport services. We conveyed to GCI that we needed representative shared broadband satellite service prices in order to complete our analysis, and requested that the company review its customer records and provide representative "best" (i.e., low) prices for shared broadband.

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any direct costs associated with operations and maintenance; unit capacity costs are these costs divided by network capacity.[22] Unit capacity costs thus provide a reasonable proxy for the LRMC for a telecommunications network.

The possibility of selling over-subscribed capacity on the satellite network effectively means that the capacity cost of providing a unit of shared broadband service (i.e., broadband provided on an over-subscribed basis) is lower than that of providing a unit of dedicated broadband service. GCI informed us that the shared service sold to commercial customers is over-subscribed to varying degrees, with the approximate range being between [redacted] [redacted] the purpose of the calculations presented in the remainder of this discussion, we will adopt the midpoint of that range, which is a [redacted]-subscription factor.

We included all direct costs for the satellite network (depreciation, direct operating costs, taxes and return on investment) in our calculation of capacity costs as a proxy for the satellite network's LRMC.[23] The shared or common costs of GCI and the satellite network are not part of the LRMC and therefore are not part of an economically-appropriate price floor for purposes of determining whether a service is being cross-subsidized. Furthermore, note that because all direct costs of the satellite network are known, this calculation is performed on the basis of the entire satellite network (as opposed to just the RHC and S&L portion, as was done in the rate-of-return analysis above).

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[22] *See*, Richard Emerson, "Theoretical Foundations of Network Costs," in NRRI (1991) Marginal Costing Techniques in Telecommunications. Capacity cost theory has been used extensively in telecommunications marginal costing practice and was the foundation of the marginal cost models used by Bellcore, including its SCIS models.

[23] Technically, marginal costs are a forward-looking concept, not a historical one. However, the satellite network is a sufficiently recently-deployed network that utilizes modern, efficient technology. While a forward-looking study may well have resulted in some cost inputs being higher than historically-incurred—such as labor and material expenses—other cost inputs may be cheaper on a going-forward basis—such as the electronics, equipment and capacity associated with the satellite network. We thus believe that for purposes of this analysis, the capacity costs of GCI's satellite network are a reasonable approximation to LRMC.

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Our calculation of the unit capacity costs (used as a proxy for LRMC) for GCI's satellite network is shown in Table 11.

Table 11: Approximation of Satellite Network's Long-Run Marginal Cost

		2014	2015	2016	2017
Depreciation of Satellite Network Assets ($M)	[A]	[redacted]	[redacted]	[redacted]	[redacted]
Transponder Operating Lease ($M)	[B]	[redacted]	[redacted]	[redacted]	[redacted]
Taxes ($M)	[C]	[redacted]	[redacted]	[redacted]	[redacted]
Allowable Return on Investment ($M)	[D]	[redacted]	[redacted]	[redacted]	[redacted]
Total Direct Expenses ($M)	[E]	[redacted]	[redacted]	[redacted]	[redacted]
Approximate LRMC Assuming All Capacity is Dedicated:					
Satellite Network Capacity (Mbps) (Dedicated)	[F]	[redacted]	[redacted]	[redacted]	[redacted]
Satellite Network Capacity (Mbps x Months)	[G]	[redacted]	[redacted]	[redacted]	[redacted]
Unit Capacity Cost ($ per Mbps per Month)	[H]	[redacted]	[redacted]	[redacted]	[redacted]
Approximate LRMC Assuming All Capacity is Shared with a [redacted] Over-subscription:					
Satellite Network Capacity (Mbps) (Shared)	[I]	[redacted]	[redacted]	[redacted]	[redacted]
Satellite Network Capacity (Mbps x Months)	[J]	[redacted]	[redacted]	[redacted]	[redacted]
Unit Capacity Cost ($ per Mbps per Month)	[K]	[redacted]	[redacted]	[redacted]	[redacted]

Notes and Sources:

[A]: Total Satellite Network Depreciation

[B]: Total Transponder Operating Lease Expenses

[C]: Taxes on RHC & S&L portion of the Satellite Network, scaled up by Transponder Utilization Share

[D]: Allowable Return on RHC & S&L portion of the Satellite Network, scaled up by Transponder Utilization Share

[E]: Sum [A] - [D]

[F]: Estimated total capacity by year. Includes C-band and Ku-band transponders. Provided by GCI.

[G] = [F] x 12

[H] = [E] x 10^6 / [G]

[I] = [F] x 3

[J] = [I] x 12

[K] = [E] x 10^6 / [J]

The table shows the derivation of unit capacity costs (i.e., per Mbps per month) for the satellite network by first calculating total capacity costs (labelled total direct expenses). For 2017, direct

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satellite network expenses were roughly [redacted]. Next, the table shows the calculation of what unit capacity costs would be if all capacity was used to provide dedicated broadband services – in other words when the unit of capacity and the unit of output are consistent with one another. When divided by the satellite network's capacity-months (i.e., the product of the satellite network capacity and the number of months in a year),[24] the table indicates that the satellite network's LRMC (approximated by its unit capacity cost) is [redacted] per Mbps-month for 2017. The satellite network's LRMC was comparable in prior years, with some fluctuations from year to year.

In order to determine whether commercial customers of dedicated broadband services are being subsidized (i.e., paying prices that are below LRMC), we compared this "dedicated" satellite network LRMC on a per Mbps-month basis to the average price per Mbps-month paid by commercial customers for both dedicated and shared satellite broadband services.

For dedicated services, commercial customers of dedicated broadband services, paid an average price of [redacted] per Mbps per month in 2016 (the latest year for which we were provided data), with rates in 2015 being closer to [redacted] per Mbps per month. These prices were well above the LRMC of satellite broadband services, which as shown in Table 11 was between [redacted] per Mbps per month (in 2017) and [redacted] per Mbps per month (in 2014). Based on this comparison, we find that commercial customers of dedicated broadband are paying a price that exceeds the LRMC of providing dedicated broadband.

To compare the LRMC to the prices for shared satellite broadband services, we converted capacity cost to a shared level. That is, what unit capacity costs would be if, hypothetically, all capacity was used to provide <u>shared</u> broadband services with an assumed over-subscription factor of [redacted] (shown at the bottom panel of Table 11). In effect, the available capacity to provide oversubscribed

[24] GCI's Network Services group estimated that the satellite network's capacity is equal to [redacted] Mbps in 2017, with [redacted] Mbps operating on C-band transponders and the remainder on Ku-band transponders. The estimated aggregate capacity in the three preceding years, also provided by GCI, is listed in row [F] of Table 11.

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services on a [redacted]sis is ti[redacted]he amount of capacity available for dedicated services. Table 11 shows that the satellite network's LRMC for shared broadband service (approximated by its unit capacity cost) ranges from [redacted] per Mbps-month to [redacted] per Mbps-month; for 2017, the LRMC was [redacted] per Mbps-month. These estimates are well below the prices paid by commercial customers for shared broadband over satellite, which averaged [redacted] per Mbps-month in the sample provided by GCI.[25]

We have not developed an estimate of the cost of providing service to a single customer class or grouping of satellite network services on a stand-alone basis. However, it is not difficult to provide an overall indication of the magnitude of stand-alone costs.[26] The stand-alone cost of providing broadband satellite service to a single customer would likely be quite high. As indicated earlier, satellite service is scalable at the transponder level, but the capacity demanded by a single customer would be much higher than the capacity provided over even a single transponder, making the stand-alone cost prohibitively high,[27] even before other types of costs were considered (e.g., a portion of managed broadband overhead).

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[25] As previously discussed, we have assumed an over-subscription factor of [redacted] in the calculations of the capacity cost of providing shared satellite broadband services that we present in Table 11. If we instead use the lower bound of the range of over-subscription factors provided by GCI [redacted]), we obtain a capacity cost estimate of [redacted] per Mbps-month in 2017, with estimates in previous years ranging from [redacted]/Mbps-month to [redacted]/Mbps-month. All are well below the average price for shared services in the sample provided by GCI ([redacted] per Mbps-month).

[26] For reasons mentioned above, a stand-alone study is not required in order to conclude that no customer is paying above the satellite network stand-alone cost. As indicated earlier, the economic literature establishes that "when the firm earns no more and no less than the competitive rate of return, if each of the firm's prices is above its average-incremental cost, then each of those prices *must* be below its stand-alone cost, and vice versa." The analyses above indicate that: 1) no satellite network customer is paying prices that are below LRMC; and, 2) that the satellite network is likely earning a competitive return on capital. Thus, it is reasonable to conclude that no satellite customer is paying prices that are above the stand-alone cost, and therefore not providing a subsidy to any customer or customer group.

[27] Recall that the average price charged to commercial customers for dedicated broadband service over satellite in 2016 was [redacted] per Mbps per month. The aggregate bandwidth for dedicated satellite

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The logic behind the stand-alone test also illustrates the gap in cost recovery that follows from pricing based on LRMC. As discussed above, if all customer classes are paying LRMC, there is no risk of cross-subsidization. However, pricing above LRMC is necessary in order to ensure that GCI receives a contribution to its joint and common costs. All customers are better off when mutual contributions to common cost are made because common costs must be recovered in order for the network provider to remain in business. That is, if a customer who is paying more than its incremental cost (i.e., and is thus making a contribution to common costs) were to disconnect from the network (thereby ending its contribution to common costs), then the burden of paying off the common costs would fall on the remaining customers (through higher prices). For the case at hand, the rural HCP customers that receive middle mile service over the satellite network, as well as GCI itself, are making contributions to the common costs of the network, and each customer would have to pay higher prices if the other were to disconnect from the satellite network.

VI. Conclusion

We have reviewed the rate of return study of GCI's satellite network that was prepared by GCI staff. Specifically, we assessed: 1) whether the methodology underlying GCI's ROR Study is consistent with regulatory costing theory and practice and provides reliable indicators of GCI's satellite network profits; and 2) whether the satellite broadband prices charged to GCI's rural healthcare provider customers are cost-justified (i.e., are not priced in a way that cross-subsidizes the prices charged to other satellite broadband customers).

We found that GCI's satellite broadband rate of return study (applicable to GCI's RHC/S&L customers) was prepared in a manner that is consistent with good regulatory costing practice and

service of the largest such customer was [redacted] Mbps, or just above [redacted] of the total GCI satellite transponder capacity.

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reflects the return earned by GCI's satellite network.[28] Our review and analysis of the data and calculations included in this study provides a strong indication that GCI is not currently earning monopoly profits on its satellite network.

We used satellite network cost and capacity data to estimate the marginal cost for satellite transport service (i.e., on a $ per Mbps-month basis). Comparing the prices paid by GCI's RHC/S&L customers for dedicated broadband satellite service and by GCI's commercial customers for shared broadband satellite service to the respective marginal costs for such services indicated that prices were above marginal cost, dismissing any immediate concern about cross-subsidization. The difference between marginal cost and charged satellite broadband prices reflect contributions to GCI's common costs, an essential requirement to keep the satellite network financially viable and an ongoing business.

[28] Determining a rate of return for any particular service of a multiproduct firm like GCI depends on the allocation methodology used to assign the non-direct (common) costs to the different services. As indicated earlier, we did not conduct a comprehensive review and/or audit of GCI's cost allocation practices and procedures. However, discussions with GCI indicate that the company applies a cost allocation methodology that is consistent with generally accepted regulatory costing practices.

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Satellite ROR Bandwidth Allocation Redacted in Entirety

Satellite ROR Revenue Allocation Redacted in Entirety

How Arbitrary Is "Arbitrary"? — or, Toward the Deserved Demise of Full Cost Allocation

By WILLIAM J. BAUMOL, MICHAEL F. KOEHN, and ROBERT D. WILLIG

The authors of this article observe that an effort to deregulate some of the activities of a regulated company while continuing to subject other activities to a rate of return ceiling may lead utility regulators back to a full allocation of cost approach to regulation which has been discredited by marginal and incremental cost analysis. In a series of hypothetical and actual examples they demonstrate the futility of efforts to allocate joint and common costs or investments between various services or products of the same firm. They conclude that if a firm is to be partially regulated and partially unregulated, rate base and rate of return as the basis of regulation must be abandoned.

Recent moves toward deregulation of a number of industries have, paradoxically, brought with them a resurgence in regulatory reliance upon the discredited accounting device referred to as "full allocation" or "full distribution" of the fixed and common costs of the regulated firm. Despite a number of reasoned moves in Congress and the courts in the direction of a marginal and incremental analysis that economics so clearly suggests, regulators seem vulnerable to entrapment into readoption of the full allocation approach by their attempt to deregulate some of the firm's activities while continuing to subject the remaining activities of the enterprise to a rate of return ceiling. Whenever there are costs and investments common to the regulated and the unregulated activities only some sort of arbitrary apportionment (allocation) of these between the two sets of activities can permit the calculation of a number that *pretends* to approximate the "true" rate of return on the regulated outputs.

This article briefly reviews the burdens upon consumers and the public generally that are likely to result. However, its major purpose is to puncture the legend that a fully allocated cost calculation produces numbers approximating any substantive economic magnitudes. We will show that different and equally plausible allocation criteria yield shockingly different numerical results, so that by judicious choice of allocation criterion, the partisan calculator can make the process yield virtually any numbers he chooses (in advance) to obtain.

Full Allocation and Sequential Deregulation

If a rate base and rate of return standard is used to

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govern the regulatory process, there is really no alternative to full allocation of costs and investments, given a decision to divide products of a firm which are closely related in their production into an unregulated portion and a regulated one. Where the activities of a firm benefit from substantial common investments or substantial common outlays (or both), there is no way to calculate a rate of return for any or all of the company's individual activities, one by one. Indeed, the difficulty is not that we cannot determine these numbers, but that such numbers themselves are necessarily figments of the imagination. An example will make this clear.

Imagine two processes, each of which requires its own machine, each costing $1 million, and that both processes require a superclean atmosphere which a $3 million item of equipment can simultaneously provide for the two activities. The bulk of the firm's investment is obviously devoted to the air purifier, and its cost is therefore the key component in a calculation of the company's overall rate of return. But who other than a medieval theologian can pretend really to know what portion of the firm's air purifier investment is truly to be ascribed to each of the firm's products? The truth of the matter is that the $3 million investment is ascribable totally to the two products together, and that no *particular* percentage of the investment may be ascribable more defensibly than some other percentage figure to either of the products by itself. But without knowing what portion of the firm's total investment is properly attributable to either product it is impossible to calculate a rate of return on either product by itself. Indeed, no meaning can really be given to the concept.[1]

If regulatory rules nevertheless require the undefinable to be defined, the only option open to those who must comply with the rules is to adopt some arbitrary device, usually dressed up to give it an appearance of reasonableness — an arbitrary rule that divides up indivisible investments and costs. This, of course, is what full allocation means.

But an arbitrary division criterion produces just the sort of results the term "arbitrary" implies. Depending upon the conventional criterion chosen for the division of investments and costs, one will obtain widely differing results from the calculation. It is generally acknowledged that the result will be affected by this choice. But there seems to be an impression that any such calculation, if carried out with sufficient care, will yield a reasonable approximation to some underlying true figure. That impression is totally unfounded. We have already shown here that where the common component of cost and investment is substantial, there is no such thing as the "true" rate of return on a portion of the firm's activities. But, in addition, although it is not generally realized, changes in the basis of allocation can make an enormous difference to the results that emerge, as will be demonstrated presently. In other words, one can have absolutely no confidence in the results obtained from any such calculation. Moreover, the numbers that emerge readily lend themselves to manipulation by any interested party through selective choice of basis of allocation.

Social Costs of Regulatory Reliance on Full Cost Allocation

As a result of the arbitrariness of full cost allocation, only increased problems for rational regulation, for the regulated firm, and for the public, can follow from any attempt at partial or sequential deregulation while continuing to control what purports to be the rate of return of the portion of the company that remains under regulation. As we have seen, such a course of action makes arbitrary allocation of investments and costs inescapable. Because of the arbitrariness of such a process and the extreme volatility of its results when the basis of allocation is changed, one can be confident that it will lead to a profusion of protracted disputes over the figures and the shares of the joint and common costs that are to be recovered from different groups of ratepaying customers of the firm.

In addition, as deregulation proceeds, increasingly fine definitions of services will undoubtedly have to be employed, and the demands upon the allocation processes will grow correspondingly. Such developments are likely to make the very process of allocation of joint and common outlays all but unmanageable by the firm or by the regulator.

But administrative difficulties are not the central issue. Rather, a number of other consequences of the full allocation process that are clearly detrimental to the public interest should be the main concern here. This is not the place to review the many unfortunate results of use of full allocation to regulate rates and earnings, since these have many times been described at length (and perhaps ad nauseum). We will only note that because the numbers that emerge from the process are indeed arbitrary, any prices determined by the regulator with their aid can only have a random relation to the prices that would emerge in competitive markets; i.e., the prices required if economic efficiency is not to be undermined.

In addition, the full allocation approach to price setting tends to foreclose any opportunity for the regulated firm to obtain adequate earnings. It is true that regulators who set rates on the basis of fully allocated costs (FAC) attempt to select a set of rates which, if realized in practice, will yield a viable return to the enterprise. But no regulator can force consumers to pay more than they are willing to pay, given the alternatives competition offers to them. As a result, in any regulated market (however defined) customers will end up paying the lower of two pertinent prices: that dictated by market forces, and that decreed by the regulator on the basis of a cost allocation.

If in some markets (as is normally the case) the FAC price is below the free market level, while in other markets the relationship is reversed, the regulated firm will be unable to charge the free market price in the former, and will be precluded from charging the FAC price in the latter. The net result tends to be a shortfall in overall revenues from the regulated services that the firm cannot make up for by high prices in the deregulated arenas, which will all presumably have been selected to be sufficiently competitive to prevent such overpricing automatically.

Arbitrariness of the Fully Allocated Cost Figures

As has been said, the obvious (but specious) way to go about the calculation of the profitability of a subset of the products of a firm is the adoption of some allocation procedure for the purpose. It is all too easy to concoct defenses for the approach. It is said to be "practical" and have a long period of usage behind it. But here, to paraphrase Disraeli, practicality consists in practicing the blunders of our predecessors. It is said that by careful and rational choice of an allocation criterion, taking account of the use to which the figures will be put, one can arrive at defensible calculations. Two examples making absolutely no extreme assumptions will demonstrate the error of this conclusion. The first example is hypothetical and is intended to make clear the source of the problem. The second example uses actual data from a very real enterprise.

Railroad regulation has been an arena in which many metaphysical disputes over the proper method of allocation have long been under way. Faced with the industry's heavy investment in track, which is a cost incurred in common on behalf of every type of traffic, a variety of allocation criteria have been advocated over the years, each criterion having been selected carefully to comport with the interests of its advocate. To minimize the appearance of arbitrariness "relative use" has usually been agreed to as the proper allocative criterion. But how should relative use be measured? By volume of shipments (number of cars)? By their relative weight (ton-miles)? By their relative value?

Clearly, when the shippers of lead try to prove they are being overcharged, they will advocate the use of bulk or value rather than weight as the proper standard on which to allocate investment, so that lead shipment will be assigned a small share of the responsibility for the railroad's track investment, and the calculated rate of return on lead shipments will be comparatively high. Similarly, precious metal shippers on a comparable mission can be relied on to find arguments against the use of value of shipment as the proper basis of allocation, while shippers of balsa wood will dependably argue that volume is a defective allocative criterion.

The consequences of the choice among such allocative criteria are not minor. This will first be shown with the aid of the following hypothetical example:

Suppose (i) that a railroad's traffic from origin A to destination B is composed exclusively of shipments of lead, precious metals, and balsa wood; (ii) that its investment in track, signals, tunnels, et cetera along the way is $100 million, with another $10 million of specialized investment on behalf of individual products; (iii) that the railroad derives annual net revenues (revenues minus direct costs) from each product equal to $3.2/3 million. Then its overall rate of return on investment will be 10 per cent; i.e., [3 × 3.2/3]/110.

Table 1 shows the hypothetical bulk (boxcar loads), weight, and values of the three products' annual shipments as well as their direct investments, on the assumption that these investments are proportionate to number of boxcars used.

Next, Table 2 shows the investment assigned to each product if the $100 million of track is allocated proportionately to carloads, weight, or value. The arithmetic is straightforward.

Table 3 shows the investment assigned to each product when the $10 million of specialized investment is included in the allocation.

Finally, Table 4 shows rates of return, calculated by dividing each product's $3-2/3 million revenue contribution by its assigned investment figures in Table 3.

Table 1

Basic Data for Hypothetical Railroad

Commodity	Carloads (000)	Weight (000 Tons)	Value (Millions)	Direct Investment
Lead	10.0	90	5	2.0
Balsa Wood	39.5	1	5	7.9
Precious Metals	0.5	9	90	0.1

Table 2

Allocated Investments
($ Millions)

Commodity	Allocation Basis: Carloads	Weight	Value
Lead	20	90	5
Balsa Wood	79	1	5
Precious Metals	1	9	90
Total	100	100	100

Table 3

Total Assigned Investments
($ Millions)

Commodity	Allocation Basis: Carloads	Weight	Value
Lead	22.0	92.0	7.0
Balsa Wood	86.9	8.9	12.9
Precious Metals	1.1	9.1	90.1
Total	110.0	110.0	110.0

Table 4

Attributed Rates of Return on Investment
(Per Cent)

Commodity	Allocation Basis: Carloads	Weight	Value
Lead	16.7	4.0	52.4
Balsa Wood	4.2	41.2	28.4
Precious Metals	333.6	40.3	4.1

It is clear from Table 4 that the figures for balsa wood span the narrowest of the ranges for the three commodities. Yet, it is seen that by judicious choice of the allocation criterion its rate of return can be changed from a clearly inadequate 4.2 per cent (Column 1) to an excessive 41 per cent (Column 2). The precious metals figure is even more sensitive, being transformable from a low of 4.1 per cent to a high well in excess of 300 per cent. This, surely, is a most curious way to calculate *the* rate of return for a product line.

Such maleability of fully allocated costs and rates of return is not a mere artifact of our hypothetical example. Tables 5 and 6 represent numbers for T. Rowe Price Associates, a large mutual fund manager, and one of its money market mutual funds, with which the authors of this article recently had occasion to work.[2] Table 5 shows for the entire firm and for Prime Reserve Fund four sets of data which were used as the bases for our five allocations of those costs of the firm which were not directly attributable to any one or another of its mutual funds. These costs were, in turn, allocated by us on the basis of (1) relative mutual fund revenues, (2) relative number of labor hours utilized, (3) relative amounts spent on wages, and (4) relative number of customers served. (Because costs increase sharply with number of customers served in the mutual fund industry, in contradistinction to the size of their transactions, number of customers is not an unpersuasive allocation criterion.) Finally, since each of the preceding allocation criteria is to some degree persuasive, we have provided a fifth hybrid criterion (5), the balanced factors allocation, which uses a judiciously selected weighted average of criteria (1) to (4). The method of selection of the weights and its purpose will soon be clear.

Table 6 shows the results. For example, for 1980 the calculations allege that the rate of return on investment earned by Prime Reserve Fund was a horrendously unprofitable −125 per cent if number of customers was used as the allocation criterion, while that same mutual fund was found from an allocation based on wage costs to be earning a shockingly excessive 247 per cent on its capital.

Of course, if Prime Reserve were seeking to justify its rate of return none of the preceding methods would

TABLE 5

Derivation of Alternate Cost Allocations for Prime Reserve Fund

Allocation Method	1978	1979	1980	1981
a) Revenues				
Entire Firm (T. Rowe Price Associates)	$19,975	$23,044	$29,609	$38,731
Division A (Prime Reserve Fund)	270	1,735	4,212	8,145
Division A as a Percentage of Total Firm	1.4%	7.5%	14.2%	21.0%
Allocated Expenses	$242	$1,492	$3,274	$6,725
b) Direct Labor Hours				
Entire Firm	NA	NA	550,290	695,966
Division A	NA	NA	75,922	166,491
Division A as a Percentage of Total Firm	NA	NA	13.8%	23.9%
Expenses Allocated to A	NA	NA	$3,175	$7,650

Table continued on next page.

TABLE 5 (Continued)

Derivation of Alternate Cost Allocations for Prime Reserve Fund

Allocation Method	1978	1979	1980	1981
c) Direct Labor Dollars				
Entire Firm	NA	NA	$11,696	$15,830
Division A	NA	NA	1,146	2,199
Division A as a Percentage of Total Firm	NA	NA	9.8%	13.9%
Expenses Allocated to A	NA	NA	$2,255	$4,442
d) Number of Customers				
Entire Firm	248,490	281,210	350,957	460,993
Division A	8,338	57,343	114,607	217,027
Division A as a Percentage of Total Firm	3.4%	20.4%	32.7%	47.1%
Expenses Allocated to A	$602	$4,041	$7,515	$15,054
e) Balanced Factors Allocation*				
Entire Firm	NA	NA	NA	NA
Division A	NA	NA	NA	NA
Division A as a Percentage of Total Firm	NA	NA	17.7%	25.9%
Expenses Allocated to A	NA	NA	$3,991	$7,916

*This allocation of costs is based on a judicious assessment of the relative roles of number of customers, revenues, direct labor hours, and direct labor dollars, assigning these the respective weights in 1980 of 46.4 per cent, 20.1 per cent, 19.6 per cent, and 13.9 per cent; and in 1981 of 44.5 per cent, 19.8 per cent, 22.6 per cent, and 13.1 per cent. These weights relate to the relative size of each activity — operations, research, sales promotion, and portfolio management — as measured by direct costs and the use of an allocation rule, revenue, number of customers, et cetera, thought "best" to reflect the activity of each department.

SOURCE: "Statement of Product Line Revenues and Expenses," annual company reports and internal company documents.

TABLE 6

Ostensible Profitability of T. Rowe Prime Reserve Fund
As Calculated by Various Cost Allocation Methods

			Cost Allocation Criterion		
1979 Pretax Return	No. of Customers	Revenues	Direct Labor Hours	Direct Labor Dollars	Balanced Factors Allocation
Return on Sales	−132.9%	14.0%	NA	NA	NA
Return on Capital	−191.7%	54.9%	NA	NA	NA
Return on Assets	−113.9%	32.6%	NA	NA	NA
1980 Pretax Return					
Return on Sales	−78.4%	22.3%	24.6%	46.5%	5.2%
Return on Capital	−124.9%	81.7%	93.0%	247.0%	15.4%
Return on Assets	−71.1%	46.5%	52.9%	140.6%	8.8%
1981 Pretax Return					
Return on Sales	−84.8%	17.4%	6.1%	45.5%	2.8%
Return on Capital	−110.7%	51.0%	15.6%	201.1%	6.7%
Return on Assets	−72.9%	33.6%	10.3%	132.3%	4.4%

SOURCE: Table 5 and annual company reports, various years.

really serve the purpose, since some indicate that its earnings were far too low while others seem to imply the opposite. However, any clever advocate defending Prime Reserve position has a better choice — the balanced factors method, whose weights have indeed been selected judiciously — to show that the fund earned a most reasonable return on capital, 15.4 per cent in 1980 and 6.7 per cent in 1981. Such are the wonders of cost allocation.

Concluding Comment

The implications of the preceding data are clear. Fully allocated cost figures and the corresponding rate of return numbers simply have zero economic content. They cannot pretend to constitute approximations to *anything*. The "reasonableness" of the basis of allocation selected makes absolutely no difference except to the success of the advocates of the figures in deluding others (and perhaps themselves) about the defensibility of the numbers. There just can be no excuse for continued use of such an essentially random or, rather, fully manipulable calculation process as a basis for vital economic decisions by regulators.

Endnotes

[1]Of course, it is possible to calculate each product's incremental investment, incremental cost, and incremental return, but there is no rational ground on which to regulate the *earnings* of a particular company activity on the basis of any or all of those figures. There is no reason, for example, to claim that it is desirable for all services to yield equal *incremental* rates of return.

[2]The following analysis was prepared on behalf of T. Rowe Price Associates in Schuyt N. Rowe Price Reserve Fund, Inc., United States District Court, Southern District of New York. The data and analyses are a matter of public record.

Reviewing the Market Value of Assets

The chief financial officers of 200 of this country's largest corporations acknowledged in a recent survey that they are now paying a great deal of attention to the highest-value use of their companies' assets. Nearly three-quarters of the officers polled by Temple, Barker & Sloane, Inc., at the end of last year indicated that their firms have adopted the practice of scrutinizing the market value of assets. Of those firms that perform market value studies, some 57 per cent do them annually, while another 14 per cent review asset value every few years. The remainder (29 per cent) focus attention on the issue "when needed."

"Unfortunately," said Dr. Michael Tennican, a senior vice president of the Lexington, Massachusetts-based general management consulting firm, "for some firms in the latter category, 'when needed' might be better stated as 'too late.' We are aware of a number of situations," he said, "where companies have seriously begun thinking about restructuring only *after* receiving a call from an outsider who has a desire to take over the task from incumbent management — and who has the shares and the financing required to press the point."

According to Dr. Tennican, pressures for improvement from boards of directors and threats of takeover from corporate raiders will continue to motivate large U. S. corporations to look for opportunities to reinvigorate profitability through restructuring. A key first step to improving profitability, he argues, is for the firm to examine expected returns on the market value of assets dedicated to each identifiable line of business.

"Since traditional accounting systems provide data primarily on historic asset costs rather than market values, corporations need to undertake separate periodic market value studies in order to create maximum value for their shareholders," Dr. Tennican explained. The TBS survey found that when asset value studies are performed, they are typically done (in 90 per cent of the cases reported) by line of business. Approximately 40 per cent of the companies that had performed such studies engaged in some form of restructuring following their reviews.